

AMENDMENTS TO THE SPECIFICATION

Please replace original paragraphs [0017], [0035] [0039] [0050] [0051], [0054] and [0068] with the following:

[0017] In general, in one aspect, the invention relates to an apparatus for developing a sub-sea hydrocarbons field. The ~~method~~ system includes means for liquefying natural gas aboard a vessel using liquid nitrogen aboard the vessel to obtain liquefied natural gas, means for transporting the liquefied natural gas to an onshore terminal, re-gasifying the liquefied natural gas, and means for obtaining a new batch of liquid nitrogen using energy recovered from the re-gasifying the liquefied natural gas.

[0035] Referring to the drawings wherein like reference characters are used for like parts throughout the several views, Figure 4 shows one embodiment of a seabed ~~pertains~~ subsea storage hydrocarbon storage and offtake system in accordance with the present invention. The storage and offtake system comprises a storage tank 100 adapted for placement on and, possibly, attachment to, the seabed 114. The tank 100 comprises a top 100a, a bottom 100b, and one or more side walls 100c. At the base of the tank 100, there is an amount of fixed ballast, such as sand, concrete or other dense material, to provide submerged weight to overcome the buoyancy force of the hydrocarbon when the tank 100 is filled to its maximum storage capacity. In the embodiment shown, the tank 100 rests on the sea floor at a depth of approximately 6,000 feet.

[0039] The storage and off-take system further includes a vessel mooring system, which has at least one hawser 110. As shown in Figure 4, the hawser 110 includes a first end operatively coupled to the ~~surface~~ subsurface buoy 106 and a second end adapted to be accessible from the water surface 116 through the surface buoy 112. The second end is also adapted to attach to the transport vessel to anchor the transport vessel during offloading operations, as illustrated in Figure 5.

[0050] Now referring to Figures 6 and 7, as previously discussed, the storage tank 100 of the system is substantially pressure balanced. This pressure balance can be achieved by providing that the inside of the tank 100 is in fluid communication with the seawater environment 125 outside of the tank 100 at substantially the same depth. Those skilled in the art will appreciate that in the case of a pressure balanced tank 100, the transportation and installation loads, rather than differential pressure across the tank 100 during operation will

primarily affect the structural design of the tank 100. This allow for pressure balanced tanks to have substantially reduced wall thickness in comparison to enclosed storage systems on the seabed, which are subject to hydrostatic pressure differences across the walls of the tank. This also allows for feasible tanks with larger storage capacities, such as up to 2 million barrels of oil, for deepwater service, such as in depths up to 10,000 feet of water, or more. In one embodiment, for example, the tank may have dimensions of about 200 feet long, about 200 feet wide, and about 250 feet tall and may have a capacity around 750,000 barrels. Thus, embodiments of the invention may provide a lower cost option and/or increased storage capacity than other storage systems.

[0051] Examples of a pressure balanced tank during normal operations in accordance with the above description are shown in Figures 6 and 7. Figure 6 is an illustration of a storage tank 100 during a “filling” operation. Figure 7 is an illustration of a storage tank 100 during an “offtake” operation. In the examples shown, the pressure balance is achieved through the use of a fluid channel 127, which extends from a lower location inside of the storage tank 100 through an upper section of the tank 100 and into the surrounding seawater environment 125. The fluid channel 127 allows the interior of the storage tank 100 to be in fluid communication with the seawater environment 125. Hydrocarbons 121 entering the tank 100 through inlet flow distributor 130 will float to the top 100a of the tank 100 and become trapped in the riser 104 and the upper portion of the tank 100, thereby displacing water 123 in the tank toward the bottom 100b of the tank 100. Now referring to Figures 6 and 7, as previously discussed, the storage tank 100 of the system is substantially pressure balanced.

[0054] Referring to Figure 6, during production operations, as hydrocarbons enter the storage tank 100 through the inlet 122, the hydrocarbon/water interface 129 is pushed downward displacing seawater 123 out of the fluid channel 127 and into the surrounding seawater environment 125. It should be understood that in one embodiment, this hydrocarbon/water interface 129 is naturally formed by pumping hydrocarbons (oil) 121 directly on water 123 in the tank and allowing the hydrocarbons 121 to naturally rise to the top of the tank 100 displacing water 123 to the lower section of the tank 100 and out the open bottom or out fluid channel 127. However, in other embodiments this interface 129 may be mechanically maintained using a flexible or permeable membrane member in the tank, which is displaced in the tank as hydrocarbons 121 flow in or out of the tank 100.

[0068] In order to recover energy from re-gasification of the HP LNG 266, all or a portion of the HP LNG input 266 is input to the integrated LNG re-gasification air separation plant 276. The integrated LNG re-gasification air separation plant 276 takes as input air 278 compressed by a compressor 280. An output of the integrated LNG re-gasification air separation plant 276 is LIN 282, which is transferred to the FPSSV 182 (in Figure 10), and stored in FPSSV storage tanks 230. In accordance with one embodiment of the invention, one FPSSV storage tank 230 of the FPSSV may be empty when the FPSSV transports the LIN 282 offshore, and additional FPSSV storage tanks 230 will become available when ~~HP~~ LNG is re-vaporized.